The Claims

1. (withdrawn)

2. (withdrawn)

3. (withdrawn)

4. (withdrawn)

5. (withdrawn)

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6. (withdrawn)

7. (withdrawn)

8. (withdrawn)

9. (withdrawn)

10. (withdrawn)

11. (withdrawn)

12. (cancelled)

13. (cancelled)

14. (cancelled)

15. (cancelled)

16. (cancelled)

17. (cancelled)

18. (withdrawn)

19. (withdrawn)

20. (new) A method for measuring concentrations of water in a flow of an oil, gas and water mixture, said method comprising the steps of

directing a flow of a mixture of oil, gas and water through a pipe having an excitation coil around the pipe and a detector coil around the pipe in axially spaced

relation to the excitation coil, said detector coil having a different resonant frequency from the excitation coil;

applying an alternating voltage to the excitation coil at a frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

registering a resultant detector voltage in the detector coil as a measure of the electrical conductivity of the water in the mixture independently of the fractions of oil and gas in the mixture;

comparing the resultant detector voltage in the detector coil against a calibration value to determine the concentration of water in the mixture.

21. (new) A method as set forth in claim 20 where the alternating current applied to the excitation coil is in the range of from 5 to 15 MHz.

22. (new) A method for measuring concentrations of water in a flow of an oil, gas and water mixture, said method comprising the steps of

directing a flow of a mixture of oil, gas and water through a pipe having a pair of excitation coils around the pipe and a detector coil around the pipe between the excitation coils;

applying an alternating voltage to one of the excitation coils at a frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

applying an alternating voltage to the other of the excitation coils at a different frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

registering a resultant induced voltage containing two frequencies in the detector coil as a measure of the electrical conductivity of the water in the mixture independently of the fractions of oil and gas in the mixture;

detecting the amplitudes and frequencies of the induced voltage for comparison to a mathematical model to determine the concentration of water in the mixture and the conductivity of the water in the mixture.

23. (new) A method as set forth in claim 22 further comprising the steps of plotting the induced voltage as a function of the concentration of water in the flowing

mixture to determine an abrupt decline in induced voltage with increasing water concentration as a boundary layer between a water-continuous phase containing oil droplets in water and an oil-continuous phase containing water droplets in oil.

24. (new) An apparatus for measuring concentrations of water in a flow of an oil, gas and water mixture, said apparatus comprising

a pipe for conveying a flow of a mixture of oil, gas and water;

an excitation coil around said pipe;

a detector coil around said pipe in axially spaced relation to said excitation coil, said detector coil having a different resonant frequency from said excitation coil;

an oscillator for applying an alternating voltage to said excitation coil at a frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

a voltage detector for registering a resultant detector voltage in said detector coil as a measure of the electrical conductivity of the water in the mixture independently of the fractions of oil and gas in the mixture;

means for comparing the resultant detector voltage registered in said voltage detector against a calibration value to determine the concentration of water in the mixture.

25. (new) An apparatus for measuring concentrations of water in a flow of an oil, gas and water mixture, said apparatus comprising

a pipe for conveying a flow of a mixture of oil, gas and water;

a pair of excitation coils around said pipe;

a detector coil around said pipe between said excitation coils;

a first oscillator for applying an alternating voltage to one of said excitation coils at a frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

a second oscillator for applying an alternating voltage to the other of said excitation coils at a different frequency of up to 20 MHz to induce a variable magnetic field in the mixture;

a voltage detector for registering a resultant induced voltage containing two frequencies in said detector coil as a measure of the electrical conductivity of the water in the mixture independently of the fractions of oil and gas in the mixture;

means for detecting the amplitudes and frequencies of the induced voltage for comparison to a mathematical model to determine the concentration of water in the mixture and the conductivity of the water in the mixture.

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26. (new) An apparatus as set forth in claim 25 further comprising a steel housing having each of said excitation coils and said detector coil therein, said housing being disposed about said pipe.